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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/561,577

03/12/2007

Joseph Bellaiche

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PHILIPS INTELLECTUAL PROPERTY & STANDARDS

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BRIARCLIFF MANOR, NY 10510

EXAMINER

GREEN, TELLY D

ART UNIT

PAPER NUMBER

2822

MAIL DATE

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03/13/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/561,577	Applicant(s) BELLAICHE, JOSEPH	
	Examiner TELLY D. GREEN	Art Unit 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/19/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Preliminary Amendment

Receipt of preliminary amendment filed on December 19, 2005 is acknowledged.

Claim Objections

Claim **10** is objected to because of the following informalities: Claim 10 recites "The electronic device **of claim 1**..."by bonding-bumps **according to claim 9**".

Examiner notes that dependent claim 9 already depends on independent claim 1, thus giving the impression that dependent claim 10 should depend on claim 9. Appropriate correction is required.

A series of singular dependent claims is permissible in which a dependent claim refers to a preceding claim which, in turn, refers to another preceding claim.

A claim which depends from a dependent claim should not be separated by any claim which does not also depend from said dependent claim. It should be kept in mind that a dependent claim may refer to any preceding independent claim. In general, applicant's sequence will not be changed. See MPEP § 608.01(n).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims **1, 3-5, and 9-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ihara et al. (**EP1024531 A2**) in view of Cohn (**US Patent Application 2002/0146919 A1**).

In regards to claims **1, 9-11**, Ihara et al. discloses a first circuit element is constituted by a chip (not shown) and a second circuit element is constituted by a second integrated circuit or by a substrate (wafer), which are connected by bonding-bump(s) structure (**Abstract, paragraph 1, Figs. 6 and 7**), a pedestal portion (**item 24**) comprising gold and formed on a circuit element; a barrier layer (**item 42**) formed on the pedestal portion; a soldering portion formed on the barrier layer, the soldering portion (**items 44, 47, and 48**) comprising a first layer (**item 44**), a second layer (**item 48**), and an intermediate layer (**item 47**) located between the first and second layers (**Fig. 7**), but does not specifically disclose a pedestal portion comprises gold, first layer comprising gold, a second layer comprising gold, and an intermediate layer comprising tin; wherein the relative masses of gold and tin in the soldering portion are such that the composition of the soldering portion corresponds to the eutectic gold-tin composition.

Cohn discloses layers of pedestal or solder portions for bonding can comprise various combinations of materials including but not limited to gold, amalgams, gold-indium, gold-tin...(**paragraph 40**); wherein the relative masses of gold and tin in the soldering portion are such that the composition of the soldering portion corresponds to the eutectic gold-tin composition (**paragraphs 135, 147**); one bonding bump on a surface of the first circuit element bringing the first and second circuit elements into a facing relationship, with at least one bonding bump contacting the surface of the second circuit element (**Fig. 6**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings above purpose of stress during and after bonding, and a reliable/strong bond, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use (In re Leshin, 125 USPQ 416).

Ihara et al.'s invention as modified by Cohn does not particularly disclose the forming steps, however these limitations are product-by-process claims (**claim 9**).

"Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F. 2d 695, 698, 227 USPQ 964, 966 (fed Cir. 1985).

In regards to claim 3, Ihara et al.'s invention as modified by Cohn does not specifically disclose the thickness of the first layer of the soldering portion is in the range 1.0 to 1.3 μ m, wherein the thickness of the second layer of the soldering portion is in the range 0.7 to 0.8 μ m, and wherein the thickness of the intermediate layer of the soldering portion is in the range 1.5 to 1.8 μ m.

However, the applicant has not established the critical nature of the thickness of the first layer of the soldering portion being in a range of 1.0 to 1.3 μ m, the thickness of the second layer of the soldering portion being in a range of 0.7 to 0.8 μ m, or the thickness of the intermediate layer of the soldering portion being in a range of 1.5 to 1.8 μ m. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have various ranges for the purpose of reliable and stronger bonds, and various bonding process in general.

In regards to claim 4, Ihara et al.’s invention as modified by Cohn does not specifically disclose the thickness of the first layer of the soldering portion is approximately 1.15 μ m, wherein the thickness of the second layer of the soldering portion is approximately 0.75 μ m, and wherein the thickness of the intermediate layer of the soldering portion is approximately 1.65 μ m. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the thickness of the first layer of the soldering portion approximately 1.15 μ m, the thickness of the second layer of the soldering portion approximately 0.75 μ m, and the thickness of the intermediate layer of the soldering portion approximately 1.65 μ m for the purpose of reliable and stronger bonds, and various bonding process in general, since it has been held that discovering an

optimum value of a result effective variable **involves** only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

In regards to claim 5, Ihara et al.'s invention as modified by Cohn does not specifically disclose wherein the height of the bonding-bump is of the order of 35 μm , and the diameter thereof is of the order of 60 μm . It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the height of the bonding-bump is of the order of 35 μm , and the diameter thereof is of the order of 60 μm for the purpose of stress during and after bonding, since it has been held that discovering an optimum value of a result effective variable **involves** only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

2. Claims **2, 7, and 8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ihara et al. (**EP1024531 A2**) in view of Cohn (**US Patent Application 2002/0146919 A1**), as applied to claims **1, 3-5, 10 and 11** above, and further in view of Lee et al. (**US Patent Application 2002/0121692 A1**).

In regards to claims 2, 7 and 8, Ihara et al. discloses a pedestal portion (**item 24**) comprising gold and formed on a circuit element; a barrier layer (**item 42**) formed on the pedestal portion; a soldering portion formed on the barrier layer, the soldering portion (**items 44, 47, and 48**) comprising a first layer (**item 44**), a second layer (**item 48**), and an intermediate layer (**item 47**) located between the first and second layers (**Fig. 7**),

Cohn discloses layers of solder portions for bonding can comprise various combinations of materials including but not limited to gold, amalgams, gold-indium, gold-tin...(**paragraph 40**); wherein the relative masses of gold and tin in the soldering portion are such that the

composition of the soldering portion corresponds to the eutectic gold-tin composition **(paragraphs 135, 147)**; a titanium seed layer on the circuit element; mask on titanium seed layer **(paragraphs 83-85, 90, 102 and 103, Figs. 7A and 7B).**

Lee et al. discloses barrier/seed layer **(items 36, 35)** at locations corresponding to contacts **(item 32)** on the circuit element; mask **(item 37)** to define at least one opening; portions of the barrier/seed layer exposed in at least one opening **(Figs. 9-16)**; the height of the pedestal portion is of order of 30 μ m (10 to 100 μ m) **(paragraph 90).**

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings above for the purpose of stress during and after bonding, and a reliable/strong bond, and electrical connection, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use (In re Leshin, 125 USPQ 416).

Ihara et al.'s invention as modified by Cohn and Lee et al. does not particularly disclose the forming steps, however these limitations are product-by-process claims **(claims 7 and 8).**

"Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F. 2d 695, 698, 227 USPQ 964,

966 (fed Cir. 1985).

3. Claims **6** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ihara et al. (**EP1024531 A2**) in view of Cohn (**US Patent Application 2002/0146919 A1**), as applied to claims **1, 3-5, 10 and 11** above, and further in view of Lampen et al. (**US Patent 6,175,287**).

In regards to claim 6, Ihara et al.'s invention as modified by Cohn does not specifically disclose a bump structure formed on a monolithic microwave integrated circuit (MMIC).

Lampen et al. discloses a bump structure formed on a MMIC (**Abstract**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings above purpose of improving the performance at microwave and millimeter wave frequencies.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are cited for disclosing related limitations of the applicant's claimed and disclosed invention.

Jin et al. (US Patent Application 2003/0219966 A1)

Ihara et al. (US Patent 7,220,657 B2)

Distefano et al. (US Patent 6,007,349)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TELLY D. GREEN whose telephone number is

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(571)270-3204. The examiner can normally be reached on Monday thru Friday 7:30 AM - 5:00 PM EST..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Zandra V. Smith/
Supervisory Patent Examiner, Art Unit 2822

/Telly D Green/
Examiner, Art Unit 2822
February 26, 2008